



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8
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DENVER, CO 80202-2466

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Ref: 8EPR-ER

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ACTION MEMORANDUM AMENDMENT

SUBJECT: Request for a declaration of a public health emergency, for headquarters approval of a ceiling increase, and a modification of the proposed scope of response for the Time-Critical Removal Action at the **Libby Asbestos Site** - Libby, Lincoln County, Montana.

FROM: Jack W. McGraw
Acting Regional Administrator

TO: Marianne Lamont Horinko
Assistant Administrator
Office of Solid Waste and Emergency Response

THROUGH: Larry Reed, Acting Director
Office of Emergency and Remedial Response

Site ID#: BC

Category of Removal: Time Critical, Non-NPL, EPA Fund-Lead

I. PURPOSE

The purpose of this ACTION MEMORANDUM AMENDMENT is threefold: 1) to declare that the extensive medical impact from amphibole asbestos exposure in the Libby Valley in Lincoln County, Montana constitutes a public health emergency; 2) to request and document headquarters approval of a ceiling increase for the Libby Asbestos Site (Site); and 3) to modify and expand the scope of the Removal Action described herein within the Site, located in Lincoln County, Montana. The proposed modification in the scope of the Removal Action would include continuing to remove amphibole asbestos contaminated vermiculite ores and mining wastes from additional residential and business properties, as well as the removal of amphibole asbestos contaminated vermiculite insulation from all properties at the Site. The initial Removal Action was authorized by the Action Memorandum dated May 23, 2000, and addressed the threats posed by high levels of amphibole asbestos at the Screening Plant (EPA-lead) and the Export


Look to add removal/remedial interface.



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Plant (PRP-lead). An Action Memorandum Amendment was approved by Headquarters on August 13, 2001, that increased the Site ceiling, and added to the number of locations where Removal Actions were being undertaken.

To date, all the Removal Actions undertaken have addressed amphibole asbestos contamination associated with vermiculite ores and/or mining wastes. This material has been found at either the former W.R. Grace & Company (Grace) processing plants, or at locations around the Libby Valley where the material had been deposited. Through on-going investigations, more properties where such ores and/or mining wastes have been deposited have been identified. In addition, investigations by EPA, the Agency for Toxic Substances and Disease Registry (ATSDR), the National Institute for Occupational Safety and Health (NIOSH), the Public Health Service (PHS) and local physicians have raised the concern that exposure to the amphibole asbestos in Zonolite Attic Insulation (ZAI- a loose fill, vermiculite insulation manufactured by W.R. Grace & Company and its predecessors from Libby vermiculite ore) has, and is contributing, along with other exposure pathways to releases and threatened releases of amphibole asbestos which are cumulatively causing asbestos related disease that is prevalent in the Libby area.

phras...  This Action Memorandum Amendment is designed to change the scope of the Removal Action to begin a more comprehensive removal of all sources of amphibole asbestos (including ZAI) where significant exposure is taking place. This approach is necessary because the EPA and ATSDR investigations indicate that people in Libby face multiple exposure pathways to amphibole asbestos and that most all of these pathways are contributing to the asbestos related health problems in the Libby area.. Programmatically, this is significant because 40 CFR 300.400(b)(2) generally limits EPA's authority to respond to releases of hazardous substances "From products that are part of the structure of, and result in exposure within, residential buildings or business or community structures;" unless the lead agency determines that a release constitutes a public health emergency and that no other person with authority and capability will do so in a timely manner. This issue will be discussed further in the body of this memorandum.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Removal Site Evaluation

Vermiculite was discovered just outside Libby, Montana, in 1881 by gold miners. In the early 1920's initial mining operations were begun by Mr. Edward Alley on the vermiculite ore body located approximately 7 miles northeast of Libby (Figure 1). Full scale operations began later that decade under the name of the Universal Zonolite Insulation Company (Zonolite). This ore body also contained amphibole asbestos fibers of the tremolite-actinolite-richterite-winchite solid solution series (herein referred to as amphibole asbestos or "Libby amphibole," Bureau of Mines Monograph, 1928). Unlike,

the commercially exploited chrysotile asbestos, the Libby amphibole material has never been used commercially on a wide scale, and for the mine's operating life it was considered a tramp contaminant. The commercially exploited vermiculite was used in a variety of products, including in insulation and construction materials, as a carrier for fertilizer and other agricultural chemicals, and as a soil conditioner.

Operations at the mine were fairly simple. The ore was strip mined using conventional equipment and then processed in an on-site dry mill to remove waste rock and overburden. Once beneficiated, the processed ore was trucked down Rainey Creek Road to the Screening Plant, which separated the milled ore into five size ranges for use in various products. From there, the material was shipped across the country, predominantly by rail, for either direct inclusion in products, or for expansion (also known as exfoliation) prior to use in products. Expansion (also known as "exfoliation" or "popping") was accomplished by heating the ore, usually in a dry kiln, to approximately 2000 °F, which boiled the water trapped in the crystalline matrix of the vermiculite. This expanded the material by a factor of 10 to 15 fold.

In Libby, operations handling this material occurred at four main locations: the Mine and Mill located on Rainey Creek Road on top of Zonolite Mountain; the Screening Plant and Railroad Loading Station located astride the Kootenai River at the intersection of Rainey Creek Road and Highway 37 (the Screening Plant); the Expansion/Export Plant (the Export Plant) located off Highway 37 where it crosses the Kootenai River; and at an Expansion Plant located at the end of Lincoln Road, near 5th Street (Figure 2). The Lincoln Road Expansion Plant apparently went off line sometime in the early 1950's, and has since been demolished. Investigations are underway to determine the exact location of this facility.

In 1963, the W.R. Grace Company (Grace) purchased Zonolite and continued operations in a similar fashion. A wet milling process was added to the operation in 1975, which operated in tandem with the dry mill, until the dry mill was taken off line in 1985. Expansion operations at the Export Plant ceased in Libby sometime prior to 1981, although this area was still used to bag and export milled ore until mining operations were stopped in 1990. Before the mine closed in 1990, Libby produced about 80% of the world's supply of vermiculite.

The Action Memorandum dated May 23, 2000 provides the basic description of the mine and processing facilities, and outlines the Removal Actions initiated in the Summer of 2000. In the Summer of 2001, actions begun in 2000 were continued, and several more removal actions were initiated at other locations around the Libby area. These were discussed in the first Amendment to the Action Memorandum, which was approved by Acting Assistant Administrator for OSWER on August 13, 2001. A further description of the Site history, these actions, and the areas addressed will not be repeated here. As site investigations continue additional properties, mostly residential, where vermiculite ores and/or mining wastes containing amphibole asbestos have been deposited are being

identified along with more exposure pathways, hence the expanding scope of the Removal Action. Because of this continued expansion, as well as because of conditions at the vermiculite mine, the Agency is in the process of proposing the Site for inclusion on the National Priorities List (NPL).

Typically, the amphibole asbestos contamination found in the Libby Valley comes from one or some combination of eight sources: a) Vermiculite mining wastes; b) Vermiculite ores; c) Vermiculite processing wastes; d) Bulk residuals from vermiculite processing; e) "Tremolite rocks;" f) ZAI; g) Contaminated settled dust; and/or h) Airborne/ambient dispersion. Each of these source materials is discussed below. For all air data reported below all air sample results are from Transmission Electron Microscopy (TEM) reported in f/cc of Phase Contrast Microscopy Equivalent fibers (PCME). This convention, and its use in from the Libby Database are discussed in the December 20, 2001 memorandum from Dr. Weis, and will not be repeated here. It should be noted that in some cases the air sampling data found in Attachment 1 includes direct Phase Contrast Microscopy by NIOSH Method 7400 (PCM) data, AHERA TEM protocol asbestos structure data, and International Standards Organization, Method 10312 (ISO 10312) or combinations of all three fiber counting protocols reported side by side. Further, the ISO 10312 data is "binned" along various fiber morphology (i.e, length, width, aspect ratio) and fiber type, and includes identified asbestos materials that do not meet the PCME definition in separate "bins." Care must be taken when reviewing the data found in Attachment I, and comparing it to the discussion found below.

a) Vermiculite mining wastes Tailings and overburden from the vermiculite mining operations have been used as a fill material at various locations around Libby. For example, as discussed in the August 13, 2001, Action Memorandum Amendment vermiculite mine tailings were used to construct running tracks at the Libby High School and Libby Middle School. The mine tailings tend to appear white to grey in color, and have the texture of a coarse sand to a <1" rock. Samples of pure mine tailings analyzed by Polarized Light Microscopy (PLM) range from trace to 30% amphibole asbestos, with typical values between 3 to 12%. Also evident in the matrix of the mine tailings are small chunks of "tremolite rocks," which when analyzed individually range in asbestos concentrations >80% by PLM (see "e" below). Testing by W.R. Grace & Co of students running on the track in the early 1980s indicated that airborne asbestos levels exceeding 0.1 f/cc could easily be generated (see August 23, 2001 Action Memorandum Amendment) during even wet, low use conditions.

b) Vermiculite ores Screened vermiculite ores are typically found either mixed into gardens or in bulk piles in and around the Libby area. They appear as dark green to black flat flakes, with gold flecks of color. The flakes can range from the size of a coarse sand to about <½" across. Screened vermiculite ore ranges from trace to 12% asbestos by PLM, with typical values between 3 to 8%. This is the most common material found to

date on residential properties with yard contamination. Most home owners report picking up the material in bulk from either the Export Plant or the Screening Plant where it was given away for free on occasion by Grace. It is common to find the ore blended into garden soils. During the 1970's W.R. Grace & Co. conducted a series of exposure evaluations for people handling various forms of vermiculite ores. These investigations indicate that personnel exposure levels when handling the bulk ore can exceed 1.0 f/cc (see Administrative Record). For example, in one test W.R. Grace had an employee simply move screened vermiculite ore from one drum into another while wearing a personal sampling pump. In other circumstances Grace did similar sampling at vermiculite expansion plants across the country where unexpanded vermiculite ore was loaded or unloaded. This is consistent with the EPA's sampling data associated with previous clean-up actions in Libby, as well as with exposure scenario testing conducted at the Screening Plant and Export Plant. Scenario testing conducted by the EPA during the Summer of 2001 suggests that even gardens with trace levels of asbestos by PLM can generate fiber levels exceeding 0.01 f/cc during gardening events (see Attachment 1-Database Snapshot; Attachment 2- Weis Memorandum, December 20, 2001). Likewise, in a study evaluating the potential localized airborne release of asbestos from contaminated soils Addison (1995) reported that "even the lowest bulk amphibole concentration tested (0.001% was still capable of producing measurable airborne asbestos concentrations (greater than 0.01 f/cc)"

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c) Vermiculite processing wastes Various waste streams were generated by the vermiculite processing plants in Libby, and across the country. There are two that are of particular significance in Libby. The first is commonly called "Stoner Rock." It is generally a reject material from the exfoliation process, an accumulation of materials scraped from the expansion furnaces that simply did not expand or pop. It is usually highly concentrated in amphibole asbestos (>35% by PLM) and appears as a white to grey-white, flaky crusted material. In Libby, Stoner rock was found on the western portion of the Export Plant, mostly used as fill. However, at other Expansion Plants around the country, such as the Western Minerals Plant in Minneapolis, Minnesota, W.R. Grace gave away the Stoner rock as fill material to whomever wished to pick it up. There have been conflicting reports about the disposition of the Stoner rock in Libby. To date, none has been found by EPA outside of the area in and/or around the Export Plant, but a few former Grace employees suggest it was given away in Libby a manner similar to that in Minneapolis. Physically, the Stoner rock is extremely friable, readily generating high levels of airborne asbestos fibers upon handling. The second processing waste is another reject from the expansion operation. However, unlike the Stoner rock, this material appears to be mostly expanded vermiculite that contains a higher percentage of unexpanded material than accepted in commercial grade ZAI. Physically, the material appears much like the expanded ZAI, but with a higher content of denser, finer grained material. Several Libby residents have reported using this material to either insulate their homes, or blend in their gardens. Analytically, it is not clear whether this material is much

different than ZAI (see “f” below), but this may warrant further investigation.

d) Bulk processing residuals Around each of the former vermiculite processing plants, and along portions of the rail corridor through Libby, are remnant vermiculite materials left behind at the processing plants when operations ceased at each location. For example, various vermiculite materials (e.g. -unscreened and screened ore) were left behind at the Screening Plant. In turn, some of this material was used as fill, or found in bulk piles on the two KDC parcels (see August 23, 2001 Action Memorandum Amendment). It is usually vary similar in appearance and asbestos content to the vermiculite ores described above, but due to the apparent presence of unscreened ore it can have larger chunks of vermiculite. There also can be visually identifiable fractions or veins of nearly pure amphibole asbestos material, or even separate “tremolite rocks” (see “e” below).

e) Tremolite Rocks Throughout the vermiculite mine one can identify veins or chunks (ranging in size from small rocks to large boulders) of nearly pure amphibole asbestos, as well as some zones of visually identifiable mixtures of vermiculite and amphibole asbestos. Although the USGS has classified this material as being made up of fibers from a the broader actinolite to richterite solution series (see August 23, 2001 Action Memorandum Amendment) the material is commonly referred to as “tremolite rocks.” Tremolite rocks appear to have a grey-greenish to white hue, with occasional veins of a dark vermiculite material. Depending on the geologic form encountered, the material can have an asbestos content of 80 to nearly 100%. Outside of the vermiculite mine, the EPA has found the material used as landscaping rocks around a flower bed, or associated with vermiculite tailings in the form of small chunks. The tremolite rocks are easily identifiable by a reasonably trained geologist.

f) ZAI Zonolite or ZAI were the common brand names used by Grace and its predecessors for the exfoliated insulation produced from Libby vermiculite ore. ZAI was commonly used as a loose fill attic insulation, either blown in or placed by hand. Based on the community interviews conducted in Libby, as well as in home investigations from information collected during the ATSDR medical screening in Libby, it is believed that between 60-70% of homes and businesses within the city limits of Libby contain Zonolite insulation. Although the percentage appears to drop off, Zonolite insulation was also used in homes throughout the Libby Valley outside the city limits.

When analyzed by Polarized Light Microscopy (PLM-NIOSH Method 9002) bulk samples of Zonolite insulation typically show levels of amphibole asbestos at <1%, and range from non-detect to 5% (see bulk Zonolite insulation data within Attachment 1). However, when viewed through a Scanning Electron Microscope (SEM) all of the Zonolite insulation samples collected by EPA, including those reported as non-detect by

PLM, reveal some presence of the amphibole asbestos. Therefore, it is reasonable to conclude that all of the Zonolite insulation found in homes and buildings in Libby contains some level of the Libby amphibole asbestos.

What is more significant about the Zonolite insulation is its propensity to generate airborne, respirable asbestos fibers when disturbed. In the Spring of 2001 the EPA started a series of sampling investigations based on "exposure scenarios" in and around homes in Libby. This effort, referred to as the "Phase II Sampling Investigation" (see Phase II Sampling Plan in the Site Administrative Record) involved the collection of air and dust samples during routine household activities ranging from watching television to vacuuming to conducting renovations which directly disturbed the Zonolite insulation. Dr. Chris Weis, Regional Toxicologist for EPA Region VIII, has prepared two memoranda which cover some of the EPA's findings regarding these investigations, the first is dated July 9, 2001, and the second is dated December 20, 2001. (see Attachments 2 and 3). In short, the analytical results from the Phase II Sampling Investigation demonstrates that the ZAI will readily generate asbestos concentrations in air >1 f/cc PCME when disturbed. Concentrations would generally be higher if non-PCME asbestos fibers were included. This finding is consistent with independent investigations done by the EPA's Office of Pollution Prevention and Toxic Substances (OPPTS) in the New England area; work done by OPPTS with agricultural products that contain expanded Libby vermiculite in 2000; work done by the MAC Corporation in a home in Spokane, Washington; and investigations done by W.R. Grace & Company in the late 1970's and early 1980's (see Site Administrative Record).

Clearly, ZAI is an inherently friable material, and is resistant to encapsulation and coating techniques. Through the late 1970's W.R. Grace actively engaged in research designed to either remove the amphibole asbestos from its ore, or coat the and/or the expanded vermiculite with a variety of substances in order to eliminate this property. Throughout this project, known internally as the Tremolite Reduction Program, Grace attempted to improve the removal of amphibole asbestos in the wet-mill through the use of surfactants and/or adjustments to separation fluid densities. Grace also attempted to spray the vermiculite ore and/or the expanded vermiculite with materials, such as soybean oil and mineral oil, to reduce the release of airborne amphibole asbestos fibers when the materials were handled. These efforts were all ultimately deemed ineffective and too costly. 70

Exposure to the amphibole asbestos in Zonolite insulation will vary greatly, depending on the condition of the home, the nature of the attic usage, and whether home renovation work is conducted in or near an area where ZAI is present. At the low end would be a home in good repair, where the homeowners do not use their attic for storage or other any other activities, where the ventilation system does not disturb the airspace in the attic, and where no home renovation work has been done or is planned in the near future. At the other end of the exposure spectrum would be a local Libby tradesman, for

example such as a carpenter, contractor, or electrician who frequently works in local attics. EPA has been informed by such people in Libby, who intimately encounter Zonolite insulation several times a week as part of their normal course of business. It is reasonable to conclude that such tradesmen would be exposed to levels of amphibole asbestos exceeding the short-term and long-term OSHA Permissible Exposure Limits (PELs) every time they install a ceiling fan, remove a wall, or do a re-wiring in a home with Zonolite insulation. Innumerable variations of these exposure scenarios can logically be constructed, with the substantive variables being the length, intensity, and frequency of the exposure.

It is also clear that these exposures are taking place. On August 23, 2001, ATSDR released a report summarizing the findings of the medical screening it conducted through the Summer of 2000 (see Attachment 4). In this report, of the 5,590 who completed the full medical screening (consisting of a series pulmonary function testing, chest x-rays, and an exposure questionnaire) 2300 reported contacting ZAI "sometimes," and 620 reported contacting ZAI "frequently." That means over 52% of the people who went through the medical screening reported contact with ZAI. Although more work and follow-up investigation is underway, the data compiled to date from the Phase II Sampling investigation can be found within the Attachment 1. A discussion of the risks associated with these exposures can be found in Section II.A.3 and Section III.A.1 of this memorandum.

g) Settled dust contaminated with amphibole asbestos As of December 2001 settled dust samples were collected from 111 residential and/or business properties (totaling 261 samples). Of these 25% of the properties tested (13% of the samples collected) showed the presence of amphibole asbestos fibers greater than 5um in length, and meeting the general definition of a Phase Contrast Microscopy Equivalent (PCME) fiber (see Weis, Attachment 2). These concentration of these detections ranged up to 22,645 f/cm². Concentrations would be higher if amphibole asbestos fibers not meeting the PCME definition were also included. At this time the data set does not indicate any single source would likely explain the finding of Libby amphibole asbestos in the dust inside homes and businesses in Libby. There does not appear to be a geographic pattern (e.g.-a decreasing gradient from the mine or a former processing plant), nor does the presence of an external source (such as vermiculite ore in the garden, or ZAI in the home) necessarily correspond to indoor dust contamination in the living space. Likely, the condition and history for each individual property construct a unique set of circumstance regarding the presence of amphibole asbestos in the settled dust. It is hoped that the more methodical investigation associated with the Remedial Investigation will provide more clarity on this question.

Nonetheless, data from the Phase II Investigation indicates that if the amphibole asbestos fibers are spread into the dust in the living space of a home, or accumulated in dust within a home (such as during a renovation project) that the amphibole asbestos fibers

will be re-suspended in the air at concentrations approaching 0.05 f/cc (exceeding 1.0 f/cc if either PCM data was used, or if non-PCME fibers were included) during routine cleaning activities. Again, this finding is consistent with work sponsored by OPPTS in 1992, and with that done by Sebastien in 1977 (see Site Administrative Record).

h) Airborne or ambient distribution of amphibole asbestos fibers From a historic perspective there most certainly have been releases of significant amounts of amphibole asbestos fibers into the atmosphere from either the mining or milling conducted on Vermiculite Mountain, or from the processing of the vermiculite ores at the Screening Plant, the Export Plant, or from the Expansion Plant that operated near 6th Avenue in Libby prior to the 1950s. Some media reports suggest that the dry milling operation, employed exclusively by W.R. Grace and its predecessors up until 1975, released up to 5000 lbs./day of asbestos during peak production (Seattle Post-Intelligencer, November 1999). Sampling done by W.R. Grace in 1975 found airborne asbestos levels as high as 1.5 f/cc by PCM in ambient air in downtown Libby (see Administrative Record), while sampling conducted by an EPA contractor in 1980 found asbestos concentrations as high as 8.0 f/cc at the Screening Plant, and 0.5 f/cc at a trailer park ½ mile from the Screening Plant (check number) (MRI, 1982). However, the accuracy of the media reports has not been verified by the EPA, nor does it appear that any entity conducted any ambient testing in Libby prior to 1999 in a long-term fashion that would allow for a reliable quantitative assessment of long-term ambient asbestos concentrations outside of the mining/processing operations themselves. Nonetheless, it is reasonable to expect that some of the asbestos contamination found in yards and in settled dust in buildings not associated with vermiculite ores or mining wastes came as a result of deposition of amphibole asbestos fibers released to the air from operations. Hence, as of December 2001, EPA sampling Investigations indicated that at the 263 locations (not including the former processing facilities or the mine, or the running tracks, or the former ice skating rink) where outdoor, soil-like media samples were collected, 141 (53.6%) showed trace levels of asbestos (25.7% of the samples collected). At the over 90% of these properties no vermiculite ores or mining wastes were observed to be present. Like the settled dust results, no obvious geographic pattern has yet emerged, and the matter warrants further investigation.

Beginning in January 2000, EPA has been collecting ambient air samples via stationary samplers from a number of locations around the Libby area. As of December 2001, stationary ambient air samples collected around the mine and former processing samples during Removal activities have shown asbestos concentrations up to 0.009 f/cc PCME (for any given day personnel samples and stationary monitors around specific work areas consistently show higher levels, sometimes exceeding 1.0 f/cc PCM, AHERA, and/or PCME). Outside of the current Removal areas, stationary ambient air samples have generally been non-detect for amphibole asbestos, with only non-PCME amphibole asbestos fibers found in the Fall of 2001 in samples collected from the roof of the Lincoln County Annex Building. The indications from this are that exposures tend to be localized

around contaminated areas, and likely vary with activity, as opposed to associated with current ambient conditions around the greater Libby Valley. Given the inconsistency between personnel samples and associated perimeter ambient air samples collected concurrently at the various work locations, it is unlikely that stationary ambient air samples provide much meaningful data about current asbestos exposures.

2. Physical Location/Site Characteristics

The Libby Asbestos Site has been defined to include the greater Libby area (a.k.a. "Libby Valley"). The Site sits in a well defined mountain valley system along the Kootenai River. The Libby Valley sits at an elevation of roughly 2200 feet above mean sea level, while the surrounding mountains range from 4400 to 8000 feet above mean sea level. The area receives an average annual precipitation of 17 inches, a substantial portion coming in the form of snow during the winter months. The Libby Valley is subject to significant weather inversions. Partly as a result of the topography and these weather inversions, historically the Libby Valley has been a non-attainment area under the Clean Air Act for concentrations of particulates.

The population of Libby and surrounding communities located within a four-mile radius is estimated at 13,800, with approximately 2600 living within the city limits of Libby. The principal industries in the area consist of lumber production, mining, and summer tourism. The economy of Libby is somewhat depressed and the community has a high unemployment rate. Many of the homes tested by EPA are in need of repair, with obvious gaps in drywall where vermiculite insulation can enter the living space. There are no licensed asbestos abatement contractors in the Libby area.

The May 23, 2000, Action Memorandum, and the August 13, 2001 Action Memorandum Amendment, contained specific descriptions of the properties targeted for removal actions. These earlier actions mostly targeted the former vermiculite processing operations (e.g., the Screening Plant) or areas where large amounts of vermiculite mining wastes had been deposited (e.g., the Libby High School). However, as was noted in the August 13, 2001 memorandum, EPA's investigations were (and are) continuing to identify properties where smaller amounts of vermiculite wastes were used as backfill, or for other purposes on individual residential properties. Similarly, EPA's Phase II Sampling Investigation has begun to identify risks particular to individual homes. It is apparent then that the nature of the places where amphibole asbestos can still be found, and where action is needed, has shifted away from a few large parcels where high volumes of contamination exist, to many smaller parcels where smaller amounts of contamination are located. Hence, the further physical descriptions given in this section will be somewhat generic, broadly addressing the homes and buildings found in the Libby Valley. There will, of course, be exceptions to these characterizations, but nonetheless they shall serve to typify the majority of locations where ZAI or vermiculite ores and mining wastes may be found. For organizational purposes the discussion will be broken up into two parts: homes and businesses within the city limits of Libby, and homes and businesses in the surrounding Libby Valley.

a. Homes and Businesses within the Libby City limits: Homes within the City of Libby tend to be older (constructed prior to 1950), smaller (<1500 ft²), and on smaller lots (<1/4 acre). There are roughly 600 homes within the City limits, with an estimated 60-70% containing Zonolite insulation. Because of their age, and the harsh winter conditions in this part of Montana, the homes require a higher level of maintenance work than homes across the country. The homes typically remain tightly shut during the winter season, due to the local climate.

Most of the businesses in the City of Libby are clustered in the downtown area, along California and Mineral Avenues, and along the Highway 2 corridor. The downtown businesses are most commonly laid out in "row house style," that is, adjoining one another, and in some cases sharing a common wall or roof. Most buildings in this corridor are one or two stories. There are some stand alone buildings, as well as a few out buildings either directly attached, or associated with the main part of the business. The majority of the buildings in this business district were constructed prior to 1950.

The businesses along the Highway 2 corridor are almost all stand alone properties, with a few "strip mall" like developments. Although it varies somewhat, these buildings tend to be of more recent construction than those that house the downtown businesses. Most of these buildings are of single story construction.

There are two large commercial operations within the city limits of Libby. The Burlington-Northern Railroad (BNR) has a rail yard which straddles Highway 37 where it crosses the Kootenai River. Amphibole asbestos contamination associated with bulk vermiculite processing residuals and spilled vermiculite ores has been found on the grounds along the tracks in the rail yard. After conducting an investigation this past Spring, BNR opted to bring in an asbestos abatement crew to remove the Zonolite insulation from its buildings associated with the rail yard this past summer. The other large commercial operation is the Stimson Lumber Mill. The Stimson Lumber Mill location currently manufactures plywood and dimension lumber, but had housed some of the Zonolite processing operations prior to 1950. In addition, a portion of this property was used as a tree nursery, with various grades of Libby vermiculite ores being used in bulk. The EPA and Stimson are currently investigating the contamination associated with these former operations. In addition, several of the buildings on the Stimson Lumber Mill property also contain varying amounts of Zonolite insulation. EPA is currently working with the managers at the Stimson Mill to monitor the exposure of amphibole asbestos to their workers, including those which might come from the Zonolite insulation remaining in the buildings on the property.

BNR
Status?

Stimson
Status

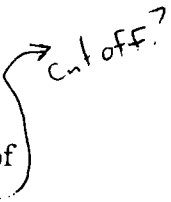
b. Homes and Businesses in the Surrounding Libby Valley: The surrounding Libby Valley encompasses a much larger geographical area than the City of Libby. When compared to those within the City of Libby, the homes in this area tend to be newer,

bigger, and on larger lots. Due to the more recent construction, Zonolite insulation is not encountered with the frequency that it is in Libby. As one moves upstream along the Kootenai River up Highway 37 the size of the land parcels increase dramatically. There are an estimated 2000 residences within the Libby valley. Although the data set is not as complete as for that within the City of Libby, it is estimated that 20-30% of these residences contain Zonolite insulation.

The pattern for construction of commercial buildings in the surrounding Libby Valley is similar to that for the residential properties: they tend to be newer, bigger, and on larger parcels of land. There are some sizeable parcels of land that are currently used for agricultural and timber production. These tend to be greater than 20 acres in size, with only a few buildings associated with them.

3. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

The Libby amphibole asbestos found at all of the locations discussed in this Action Memorandum Amendment is a hazardous substance as defined by Section 101 of CERCLA. All of the locations found within the Libby Asbestos Site that are the subject of this and previous Removal Actions share several common characteristics: 1) various vermiculite materials, contaminated with amphibole asbestos, can be found in bulk at these locations; 2) there are people playing, living or working on and/or near these locations; and 3) there is the potential for direct exposure of people to the amphibole asbestos, as well as secondary exposure of other people to fibers tracked out by those directly exposed.



The investigations to date by EPA and ATSDR also point out that these releases of amphibole asbestos have in the past, and currently, take on many forms, in a variety of locations. That is, that many residents in the Libby Valley have in the past, and currently face a set of multiple exposure pathways. The August 23, 2001 ATSDR Report (Attachment 4) clearly documents this fact. As can be seen in Table 13 of the ATSDR Report >90% of the participants in the medical screening reported 2 or more exposure pathways, while 40% reported six or more exposure pathways. The report also notes that there was an increase in the rate of occurrence of both pleural and interstitial lung abnormalities (reported by at least 2 independent radiologic reviews) observed when tracked against a reported increase in exposure pathways. For example, while only 5% of the screening participants who reported no known exposure pathway (other than living in Libby Valley) had observed pleural abnormalities (again, reported in at least 2 independent radiological reviews) 24% of the participants who had 6 or more exposure pathways had pleural abnormalities.

Likewise, the current analytical data set (Attachment 1) also documents that there

are multiple exposure pathways still in existence in the Libby Valley today. Dr. Weis' December 20, 2001 memorandum concisely illustrates this point. Section IV.3 (pp. 5-8) of Dr. Weis provides an in depth synopsis of the asbestos data by environmental media in the Libby Valley as of December 2001. Section IV.4 (pp. 8-11) of Dr. Weis' memorandum discusses the liberation of asbestos fibers into the air from the various environmental media when disturbed. A brief discussion of the amphibole asbestos found in various environmental media around the Libby Valley to date is given below. It should be noted that the analytical data is updated on a near daily basis, as Site Investigations are on-going. Therefore, for sake of consistency the numbers discussed herein will be from the set Dr. Weis used in his memo. Also, because they have been addressed in the two previous Action Memoranda, data and conditions at the Screening Plant, Export Plant, the KDC parcels, or Rainey Creek Road will not be included.

Commercial/Residential Yards: Through December 2001, approximately 29% of the samples collected of soil and soil-like media from properties in the Libby Valley showed detectable amounts of Libby amphibole asbestos (339 out of 1164), with 3.4% of the samples at levels greater than 1% when analyzed by PLM-NIOSH 9002. When evaluated on a per property basis the percentages go up. The 1164 samples were collected from 263 properties. Of the 263 properties, 162 of them had detectable levels of asbestos (62%), with 21 properties (7.9%) having asbestos concentrations >1% by PLM. Rather than following a geographical distribution, the data set seems to indicate more localized areas of contamination, typically associated with the presence of vermiculite ores or mining/processing wastes. For example, it is typical of a set of analysis from an individual home to have the contamination confined (with a few exceptions) to one area of the property, such as a garden. Looking at the data set on a per property basis, 60% of the gardens showed amphibole asbestos (66 of 109); 46% of the yards (119 of 258); and 18% of the driveways (17 of 94) showed detectable levels of amphibole asbestos. On a per sample basis 47% (87 of 183) of the garden samples collected; 26.7% (222 of 832) of the yard samples collected; and 13.9% (19 of 137) of the driveway samples collected showed detectable levels of amphibole asbestos. This pattern is consistent with property owners description (when known) of the use of the various vermiculite materials on their properties i.e- they were used mostly as a garden soil conditioner, then as fill around the yard, then as fill in the driveway.

In three instances the Agency has encountered wastes piles of bulk vermiculite ore on residential properties. From these piles 11 of 12 of the samples showed detectable levels of amphibole asbestos, 10 of 12 of the samples had levels >1%, with a range up to 10% amphibole asbestos by PLM. On two additional properties the Agency encountered Tremolite rocks, in both instances used as decorative rocks, lining the edge of a flower garden. In these cases the rocks were readily identifiable from their geologic characteristics, and were simply removed. Soil samples from both gardens showed amphibole asbestos levels >1% by PLM.

There is a large body of evidence to indicate that the amphibole asbestos fibers associated with Libby vermiculite will be released into the air when the material is disturbed. At every setting where W.R. Grace or its commercial customers mined or processed the ore there were elevated levels of airborne amphibole asbestos. As mentioned above, W.R. Grace testing of people simply transferring the vermiculite ore from one drum to the next produced airborne asbestos levels exceeding 1.0 f/cc. Likewise, W.R. Grace sampling of two students running on a track made of vermiculite mine tailings showed exposure to levels of asbestos >0.2 f/cc. In the conduct of the Removal Actions to date in Libby the EPA has seen that personnel exposure levels of asbestos can exceed 1.0 f/cc, even with engineering controls in place, to workers excavating or otherwise manipulating contaminated soil and/or vermiculite processing wastes. In the Summer of 2000 the EPA placed personnel monitors on workers who were sweeping the floors of various buildings at the Export Plant and the Screening Plant (a task that was performed on a near daily basis at both locations by the post W.R. Grace occupants of these properties). In both cases personnel exposure monitors showed amphibole asbestos exposure >0.1 f/cc. As part of the Phase II Sampling investigation the EPA conducted air sampling during the roto-tilling of a garden where trace (i.e. <1.0% by PLM) levels of amphibole asbestos were detected. The average airborne fiber concentration was 0.066 f/cc PCME (0.227 by PCM) in the personnel samples that the workers wore. These results are consistent with research many others have conducted in dealing with asbestos (e.g. -Addison, 1995; Yang, 1977-78; EPA Diamond XX, 1999????) bearing media.

Amphibole Asbestos Settled Dust in Building Interiors As of December 2001 the EPA had collected settled dust samples from 111 properties, of which 28 (25.2%) had detectable levels of amphibole asbestos PCME. Overall, 12.7% of the dust samples collected showed detectable levels of PCME amphibole asbestos fibers. The detected concentrations of Libby amphibole asbestos ranged from 20-22,645 f/cm² of PCME fibers. The number and level of detects reported here would be considerably higher if non-PCME amphibole asbestos fibers were counted. At this time, it is not clear if there are any overall patterns that explain the distribution of amphibole asbestos contamination in settled dust. Possible contributing variables would include the presence of former vermiculite workers in the building; proximity to former processing plants; presence of ZAI, condition of the building, past renovations; presence of amphibole asbestos contaminated materials on the surrounding property; and secondary contact and track in contamination from current workers contacting vermiculite. It should be noted, that as of January 2002, the EPA has begun increasing the number of properties, and the number of samples per property where settled dust samples are collected. This could affect the overall trend observed in this part of the data set.

During the Phase II Sampling Investigation, the EPA collected personnel and stationary air samples during "routine" household activities (no cleaning events) and during "active cleaning" (e.g. vacuuming, dusting). The settled dust concentrations in

these homes ranged from ND to 3658 f/cm² PCME.. Measured airborne fiber concentrations reached 0.048 f/cc PCME during the "scenario" testing. Although the statistical analysis is not yet complete, the trend does appear to be that the higher the level of amphibole asbestos in settled dust, the higher the airborne concentrations will be during household activities.

Many other researchers have evaluated the concept of asbestos contamination in dust leading to localized indoor exposures. From 1990 to 1992 EPA's Office of Pollution Prevention and Toxic Substances oversaw a series of experiments where carpets were deliberately contaminated with asbestos fibers and then vacuumed using conventional vacuum cleaners (OPPTS, 1992). The OPPTS work showed that this very common household activity would lead to asbestos exposures >0.1 f/cc, and that the higher the level in the carpet, the higher the level entrained in the air by the vacuuming. This study paralleled similar work by Sebastien (1977), Selikoff, and Addison (1995). In 2001 Dr. Michael Beard of the Research Triangle Institute proposed numerical guidelines for evaluating the risks posed by asbestos contaminated dust inside buildings (Beard, 2001). Dr. Beard proposed that in the United States that levels of asbestos fibers <500 f/cm² should be considered a low to normal; >1,000 f/cm² would be moderately contaminated; and that >10,000 f/cm² should be considered highly contaminated..

Zonolite Attic Insulation As discussed earlier in this action memorandum ZAI is present in a substantial number of homes in the Libby Valley. Over 70% of the samples of ZAI collected in Libby had detectable levels of amphibole asbestos by PLM, with >8% of the samples showing amphibole asbestos concentrations above 1%. Further analysis of ZAI by either Scanning Electron Microscopy (SEM) or Infrared Spectroscopy (IR) suggests that all ZAI contains amphibole asbestos. Further, testing by EPA Region 8, EPA-OPPTS, W.R. Grace & Co., and the MAC Corporation all show that disturbance of ZAI will generate airborne amphibole asbestos concentrations in excess of 1.0 f/cc, and in some instances exceeding 10 f/cc (Grace, 1976, et. al; see Administrative Record).

Since disturbance of ZAI will in fact generate high levels of airborne amphibole asbestos, the next question to answer is to what extent the release from ZAI is contributing to actual exposures in the Libby Valley. With the Zonolite insulation direct exposure can take on many forms.

As discussed above, the most frequent exposure to ZAI would be a Libby tradesman working in direct contact with the Zonolite in an attic or wall space. Similarly, a Libby resident who uses their attic frequently for storage, living, or work space (for example, in one Libby home the attic was used as a small gunsmith workshop, with bare Zonolite insulation exposed in the area) would also face frequent direct exposure to ZAI. It is clear that exposures of this type are in fact happening. In the ATSDR Report (see Attachment 4) 620 of the 5,590 (11%) screening participants specifically reported frequent contact with ZAI. It is reasonable to infer that with each of these exposures the Libby Valley resident would be in an atmosphere containing 0.1 to 10 f/cc amphibole asbestos. This

would could also explain why only 5% of the medical screening participants with no known exposures to amphibole asbestos (other than living in the Libby Valley) had observed lung abnormalities, while the rate of observed abnormalities was 26.6% for those reporting frequent contact with ZAI.

For a non-tradesman, or for a homeowner/resident who does not use the attic space frequently, the potential for exposure is likely less, but still palpable. The exposure could take place during a periodic household renovation. In this case the exposure would be of a similar intensity and duration as that of a tradesman (i.e. - >1.0 f/cc, lasting several hours or a few days), but of less frequency. Instead of incurring the exposure twice a week, it might happen 5-10 times over a lifetime, possibly more depending on the age and condition of the home, and the inclination of the resident to conduct their own repair/renovation work. This exposure scenario also raises the specter of the single renovation event leading to the spread of amphibole asbestos to the remainder of the home, leading to secondary exposures. During the renovation scenarios of the Phase II Sampling Investigations elevated levels of amphibole asbestos were not only measured in the attic space, but also in the living space of the homes (see Phase II data for 1022 California, 517 Montana, get address for Foote and walker house in Attachment 1) Once the amphibole asbestos is spread into the living space of the house, the Phase II "routine" and "cleaning" activity data indicates that re-entrainment will occur (see Attachment 2).

Although not likely to be as drastic, a similar pattern of exposure would occur for the resident who uses the attic for occasional storage. In several Libby Valley homes boxes of Christmas, Easter, and/or Halloween decorations were observed. It is not unreasonable to envision the resident entering the attic to retrieve and replace the stored boxes periodically throughout the year.

In some homes in Libby it has been observed that the Zonolite insulation is literally falling out from gaps around light fixtures and electrical switches. As demonstrated by the Phase II sampling, in home where the Libby amphibole asbestos has accumulated in dust (such as from leaking Zonolite, or being tracked in from outside sources) common household cleaning activities will re-entrain amphibole asbestos fibers into the air.

There are enumerable variations of these less frequent, or less intense exposures that may be logically constructed. But no matter how one would construct a particular exposure scenario, it is also clear that these types of exposures are taking place in the Libby Valley. Again referring to the ATSDR Report (see Attachment 4), over 2300 of the 5,590 screening participants reported "sometimes" coming into direct contact with ZAI. Of these 2300 participants, 481 (20.9%) had observed lung abnormalities.

When considering the implications of the release of amphibole asbestos from the various waste sources in the various environmental media discussed above, one should

revisit the effect of the multiple exposure pathways. By way of example, a Libby carpenter could have been tasked with remodeling a kitchen. If the house in question has ZAI the carpenter would face all the exposures associated with working with ZIA discussed above. The carpenter could have purchased the lumber at the former Export Plant (which was used as a retail lumber yard from 1994 until 2000) and been exposed there. If he has amphibole asbestos in his home garden (over half of the gardens sampled in Libby to date show the presence of amphibole asbestos) he would be exposed there. If he has ZAI in his own home (as 60-70% of the homes in Libby do) he would face those exposures as well. If this carpenter went to Plummer Elementary School, Libby Middle School, and Libby High School and spent anytime playing at the former ice skating rink, or running on the middle school and high school tracks (especially before the tracks were paved in 1982) he would have been exposed there. If the carpenter went to the concession stand underneath the bleachers at Libby High School (perhaps while watching his son or daughter participate in School events) he would be exposed there. This hypothetical carpenter is not an unrealistic scenario. The ATSDR Report (see Attachment 4) noted that >40% of the medical screening participants reported 6 or more exposure pathways to the amphibole asbestos in Libby vermiculite. The ATSDR Report also noted that observed lung abnormalities increased as the number of exposure pathways increased.

As discussed in the previous two Action Memoranda (May 23, 2000, August 13, 2001), the EPA has clear and compelling evidence that exposure to the Libby amphibole asbestos can result in direct adverse health effects. The Site Administrative Record contains many academic papers discussing the hazards associated with amphibole asbestos in general, and Libby amphibole asbestos in particular. There are a number of Grace papers, investigations, and memoranda that document the widespread occurrence of asbestos related disease among its workers, both in Libby (41% of Grace Libby workers with a ten year work history are reported as having asbestosis) and around the country (28% of the Grace workers handling Libby vermiculite around the country are reported as having asbestosis, e.g. see E.S. Wood, 1977, or E. Lovick, 1969). Investigations by researchers at McGill University (e.g. MacDonald 1986) and by and NIOSH (Amandus 1987, Lockey, 1984) confirm the impact to workers both in Libby, and at processing plants across the country.

In the Summer of 2000, the Agency for Toxic Substances and Disease Registry (ATSDR) undertook a massive asbestos health screening program involving over 6,000 people who may have been exposed to amphibole asbestos in or around Libby. Another 1200 people were similarly screened in the Summer of 2001. These investigations documented the widespread occurrence of lung abnormalities, not only among former Grace employees, but among their families, and the population at large in Libby (see Attachment 4) far beyond what would normally be expected. Of the 994 screening participants who had pleural abnormalities noted by two independent radiologists, 835

(84%) never worked for W.R. Grace or its predecessors. Certainly, former Grace employees had the highest rates of measured lung abnormalities (>48.5%), but a review of the Odds Ratio and multi-variate analysis conducted by ATSDR shows that secondary exposures, and behaviors where people have had direct contact with Libby vermiculite based materials also increased the chances for developing lung abnormalities.

The findings of pleural abnormalities by ATSDR is consistent with case reports by area physicians. The EPA, PHS, and ATSDR have been working closely with local physicians and the County Medical Officer, in preparing a series of epidemiological case studies. Physicians working with the Libby based Center of Asbestos Related Disease (CARD) have reported to the EPA that they have hundreds of patients with asbestos related impairments that they believed arrived from non-mining, non-vermiculite processing exposure pathways. These include area electricians and contractors who contact ZAI, people who recreated or logged in the Rainey Creek drainage, and people who played in vermiculite piles or had other direct contact with vermiculite ores and processing wastes.

In his December 20, 2001, memorandum, Dr. Weis also provides a hazard/risk analysis regarding conditions at the Site, which include some quantitative risk assessment calculations. Dr. Weis summarizes his findings as follows:

- a) Asbestos occurs in ore and processed vermiculite obtained from the Libby mine.
- b) Asbestos fibers of the type that occur in vermiculite ore from the mine in Libby are hazardous to humans when inhaled.
- c) Asbestos material fibers that are characteristic of those that occur in materials from the Libby mine are present in a variety of different source materials at residential and commercial locations in and around the community of Libby. Outdoor source materials include yard soil, garden soil, driveway material, and assorted mine waste materials, while indoor source materials include dust and vermiculite insulation.
- d) Disturbances of asbestos-contaminated source materials by activities similar to those that are likely to be performed by area residents or workers can result in exposure to respirable asbestos fibers in the air.
- e) The concentration of fibers in air generated by disturbance of source materials may exceed OSHA standards for acceptable occupational exposure, and estimated excess cancer risks can exceed EPA's typical risk range (1E-04 to 1E-06) by an order of magnitude or more. There are several factors which suggest these risk estimates may be too low and the actual risks are even greater. (Emphasis added)

Dr. Weis' risk calculations suggest, much like the discussions above indicates, that workers contacting ZAI insulation face the highest risks, $> 1E-03$. Residents who have asbestos contaminated dust in their homes also face unacceptable risks. In this memorandum, Dr. Weis does not make any quantitative risk assessment calculations for people contacting vermiculite ores ore mining/processing wastes directly, although these were addressed in his earlier memoranda (May 20, 2000-Attachment 5; and July 9, 2001-Attachment 3).

The National Contingency Plan (NCP), found at 40 CFR part 300 does not require a quantitative risk assessment to be conducted in support of Removal Actions. Only the Removal criteria found at 40 CFR 300.415(b)(2) need be considered when assessing the threats posed by a release of a hazardous substance in order to determine the need for undertaking a Removal Action, and these are discussed in Section III.A of this Action Memorandum Amendment. However, in this case Dr. Weis made his evaluations in response to requests from the Site On Scene Coordinators (OSCs) to help sort through the rather complicated factors that need to be considered when evaluating a rather non-traditional asbestos Site. The real utility of a hazard/ risk analysis, including risk assessment calculations, is the formulation of the conceptual site model, assessing as thoroughly as possible all the actual and potential exposures taking place. With this in mind it is worthwhile to discuss the variables or assumptions that leads Dr. Weis to think that his risk assessment calculations might understate the actual risks on the Libby Site.

- a) The quantitative calculations in Dr. Weis' memorandum treat each exposure independently. The mathematical risk employed by the Agency, the Integrated Risk Information System (IRIS) does not easily allow for the integration of multiple exposure pathways, which is what in fact exists in Libby. As has been discussed at length above, it is highly unlikely that an individual in Libby would face only one source of exposure to amphibole asbestos. To the contrary, as borne out by the ATSDR Report, it is highly probable that an individual would face two or more.
- b) The IRIS model ignores fibers which are known to exist, and does not account for differences in fiber morphology and type. The risk slope factors employed by IRIS attribute equal risk to all asbestos fibers that meet the PCME definition, and attributes no risk to those that do not meet this definition. In addition, all types of asbestos fibers are assumed to be of equal toxicity. These three points are of great contention among toxicologists. Many toxicologist (e.g. Berman and Crump, 1999; and Van Oss, 2000) have suggested that asbestos risk assessment models should employ weighted slope factors, attributing greater toxicity to the longer fibers, while giving some weight (albeit substantially less weight) to shorter fibers. These researchers would also suggest that in general amphibole asbestos fibers are more potent than serpentine asbestos fibers. These are more than fine academic points. To date, EPA sampling in Libby indicates that greater than 2/3 of the amphibole

asbestos fibers observed in air and dust samples do not meet the PCME definition, and therefore are given no weight in risk calculations. A similar observation was made by a W.R. Grace researcher, Dr. Julie Yang, as early as 1976. In a report dated April 8, 1976 (see Attachment 6) Dr. Yang reports that fibers from several "randomly collected" air samples from Libby are "mostly less than 10um (<8%>10um), and the geometric mean length of the fibers is around 3.1um." At this point in time no one disputes that the Grace workers in Libby suffered tremendous rates of asbestos related disease (see W.R. Grace comments, dated December 21, 2001, on the Libby Administrative Record Supplement). From both EPA and Grace data it now appears likely that this disease rate occurred as a result of exposure to a fiber size distribution with a mean length less than 5 um. It would be reasonable to consider this type of information when evaluating the import of any quantitative risk calculation. Further on this point, in 1978 Dr. William E. Smith produced a report for W.R. Grace (see Attachment 7) based on the intra-pleural injection of Libby amphibole into Golden Hamsters. The fibers used were reported to have a geometric mean length of 2.07um. The report noted that single intra-pleural injections of the prepared samples produced a variety of tumors, including pleural mesothelioma, and that the samples were carcinogenic under the conditions of this experiment (pp. 7-9). While the translation of the findings of an injection model animal study to risk from human inhalation is certainly problematic, given what is known about the impact to people in Libby, it would seem equally problematic to dismiss the findings out of hand.

- c) The IRIS model also may discount short term exposures and non-interstitial cancer endpoints, thus ignoring fibrosis and mesothelioma, and largely ignoring any risks from relatively short exposures. In Attachment 8 is a case study report from a group of physicians who report autopsy findings of a 65 year-old gentleman whose clinical diagnosis was "idiopathic pulmonary fibrosis." The man in question had worked for one summer at a Zonolite expansion plant. A posed-mortem evaluation of lung tissue collected from the gentleman revealed a lung fiber burden of over 8,000,000 fibers/g of dry lung, most of which were tremolite asbestos. There was an additional lung fiber burden of 5,000,000 fibers/g dry lung of asbestiform fibers not matching any of the "standard asbestos varieties." Quoting from the abstract: "Comparison analysis of a sample of Libby Montana vermiculite showed a similar mix of asbestiform fibers including tremolite asbestos." The Doctors concluded that the gentleman died from "severe fibrocalcific pleural plaques and end-stage respiratory failure" from exposure to Libby amphibole in a single summer some 50 years earlier. Discussions with Libby area physicians indicate that there are many similar cases being treated in Libby. The IRIS model would lead one to believe that such findings are simply not possible.

For details one should reference the attachments here, and the documents in the Administrative Record.

4. NPL status

The Site is currently not on the National Priorities List (NPL). However, in January 2002, the Governor of Montana designated the Site as the State's highest priority, and requested that as such the Site be included on the NPL as per 40 CFR 300.425(c)(2). The EPA Superfund Site Assessment Team had already conducted a Listing Site Inspection (LSI) for the Libby Asbestos Site. A significant amount of input was sought and received from the public, as well as State and local elected officials, as how to best proceed with the Site in the long term. Plans are now underway to propose the Site for the NPL in early 2002. A Remedial Project Manager has been designated for the Site and has joined the Libby Site Team, beginning work on a Remedial Investigation, and coordinating work with the Removal Program. Given this level of coordination all current removal actions will be consistent with any remedial cleanup that might be taken in the future.

B. Other Actions to Date

1. Previous actions

Removal Actions were initiated in the Spring of 2000 to begin cleanup of the amphibole asbestos at the Screening and the Export Plants. On July 14, 2000, W.R. Grace reacquired control of the mine and the KDC properties. On July 18, 2000, Grace refused EPA access to these areas for all activities, including the use of the mine for a repository and to clean-up the KDC parcels. Subsequently, Grace allowed access for sampling investigations and oversight, but still withheld access for cleanup and disposal. On September 14, 2000, the Department of Justice (DOJ), on behalf of EPA, filed a lawsuit in the U.S. District Court in Missoula, Montana, against W.R. Grace - seeking full access to the KDC parcels and the mine. A brief hearing was held on December 20, 2000, and two Court ordered mediation sessions were held on January 25 & 29, 2001. However, the mediation proved fruitless, and the matter was sent back to the Court in Missoula. On March 9, 2001, the U.S. District Court in Missoula made a partial ruling (the issue of appropriate penalties was subsequently settled, with Grace agreeing to place \$2.75 M in a Special Environmental Project Account designated for augmenting asbestos related medical care in Libby) in favor of the EPA. This ruling gave EPA full access to use the mine for a repository and to the KDC parcels for removal activities. On April 2, 2001, W.R. Grace & Co. filed for Chapter 11 bankruptcy protection. Because the UAO addressing the Export Plant was issued prior to the bankruptcy filing, Grace continued work at the Export Plant with EPA oversight.

After a winter shutdown, removal work at the Screening Plant and Export Plant was resumed in April of 2001. In addition, sampling investigations had identified several more properties with vermiculite materials which contained Libby amphibole asbestos. The locations specifically identified in the August 13, 2001, Action Memorandum Amendment included the Libby High School; Libby Middle School; Plummer Elementary School; the Seifke Property; Rainy Creek Road; and the Brownlee Property. In addition, during the Summer of 2001 several more residential properties were found to have Libby amphibole

asbestos contamination associated with vermiculite ores and mining wastes that had been deposited on the properties. These included the Temple Property, the Burris Property, the Johnson Property; the Sanderson Property; the Calhoun Property; the Spencer Property; the Westfall Property; the Struck Property; the Rice Property; the Fuhlendorf Property; and the Champion Haul Road. Removal work was started on all of these properties. Sampling Investigation work is continuing through the Winter 2002, with the high probability of identifying more properties containing vermiculite ores and mining/processing wastes that will require response actions.

All told, during the Spring/Summer of 2001 the EPA moved over 210,000 yds.³ of amphibole asbestos contaminated soil, and over 35,000 yds.³ of contaminated debris back to the former vermiculite mine. Below is a brief update on each individual property addressed:

a. The Export Plant: Grace has completed the demolition and disposal of 4 of the 5 buildings on this property. The only building remaining on the property is the one that houses the planer owned and operated by Millwork West. Since the beginning of the Removal Action the Agency has worked with Millwork West in an effort to keep the planer, which is normally operated on a batch basis 4 to 10 days a month, in business. It appears now that Grace is near completing negotiations that will permanently relocate the Planer, and allow for the demolition of this final building. By October 2001, Grace had completed the excavation of asbestos contaminated soil from the property, with the exception of the asbestos contaminated soil to be removed from underneath the Planer Building. This work should be completed in the Spring/Summer 2002, with final property restoration to be completed later in Summer 2002. In total, Grace has moved approximately 16,000 yds.³ of amphibole asbestos contaminated soil, and 1500 yds.³ of debris back to the vermiculite mine.

b. The Screening Plant: The Screening Plant is divided into five parcels: two owned by KDC, one by the Wise family, and two parcels owned and operated by the Raintree Nursery. The Raintree Nursery property, and the Wise property have been completely excavated and partially backfilled, awaiting final grading and restoration in the Summer of 2002. In addition, all of the structures on the Raintree parcel were demolished.. There remains some subsurface amphibole asbestos (concentrations up to 2% by PLM) at depths at least four feet below ground surface under some of the excavated area on the Raintree Nursery parcel. This is due to what appears to be naturally occurring layers of asbestos material underlying portions of the Site. An explanation of this occurrence can be found the Site file (see Peronard, March 8, 2001). A fabric membrane was placed at the four-foot excavation depth prior to backfilling on the north side of the Site to aid soil stability, and to mark the limits of excavation.

The two KDC parcels are commonly referred to as the KDC-Bluffs, and the KDC - Flyway. On the KDC Bluffs there were three discrete disposal areas containing vermiculite wastes that were targeted for removal. These three areas have been excavated and backfilled. However, sampling done in the Summer of 2001 indicates there remains a

2-4 acre area on the KDC-Bluffs parcel which has amphibole asbestos contamination across the surface, albeit at levels less than 1% asbestos by PLM. This area is not currently in use, but it is zoned and planned for residential development. Because the Agency's investigations in Libby and other Superfund Sites have indicated that levels of asbestos at less than 1% by PLM can generate significant levels of airborne asbestos under certain conditions, this area remains a concern. A request has been made to the Regional Toxicologist for an evaluation and recommendation for this area.

The excavation of contaminated soil from the KDC-Flyway parcel was begun in August 2001, and stopped for the season in October 2001. It is estimated that 30-40% of the amphibole asbestos contaminated soil targeted for removal has been excavated from this parcel. Work will resume on this action in the Spring of 2002.

c. The Rainy Creek Road: In order to prepare Rainy Creek Road for use as a haul road and to help eliminate the problem of elevated airborne asbestos fibers of the intersection of Highway 37 and Rainy Creek Road encountered last October/November 2000, the EPA paved the lower half-mile of the road. A decontamination station has been built at the transition from the unpaved to the paved portion of the road. Active dust suppression is in place for the unpaved section of the road as well.

On May 1, 2001, the USFS and Lincoln County issued a joint temporary road closure for the Rainy Creek Road, restricting access to the area for the general public. In the short term, these preventive measures have eliminated the potential exposure of the public to asbestos fibers that may result from hauling activities. EPA has been working with the USFS on developing a site specific Memorandum of Understanding to coordinate each Agency's long term responsibility for the Site.

d. Plummer Elementary School: All removal and restoration work targeted for Plummer Elementary was completed in the Summer of 2001. This involved the excavation of all amphibole asbestos contaminated soil, and the restoration of the area for use as a playground. No further action is planned.

e. Libby High School and Libby Middle School: Ore tailings containing amphibole asbestos were initially found in the subsurface of the asphalt-capped running tracks at both schools. Also, "tremolite rocks" were found on the ground surface in the vicinity of the tracks of the high school, as well as contamination underneath the bleachers around the track, and in equipment and locker rooms in the area. At the High School all of the tailings and vermiculite wastes, as well as the contamination underneath the bleachers and in the buildings around the track were removed in the Summer/Fall of 2001. Most of the restoration for the High School has been completed. The re-surfacing of the track itself is scheduled for the Spring of 2002.

At the Middle School all asbestos containing wastes have been removed, and most restoration has been completed. The track will be resurfaced in Spring 2002.

f. The Brownlee Property: The pile of unexfoliated vermiculite, and all associated amphibole asbestos contamination at the Brownlee Property has been removed, and restoration has been completed.

g. The Seifke Property: All the equipment contaminated with amphibole asbestos was either cleaned or removed for disposal. Two of the outbuildings on the property were

demolished, and the interior of the main residence was cleaned of Libby amphibole asbestos. Soil contaminated with amphibole asbestos was excavated, and all generated soil and debris was taken to the mine for disposal. Most restoration activities have been completed, with some building reconstruction slated for Summer 2002.

h. The Burris and Calhoun Properties: The Burris and Calhoun Properties both contained large waste rocks bearing pure veins of the Libby amphibole asbestos that had been used as landscaping rocks around gardens on the properties. The garden soils contained amphibole asbestos at levels greater than 1%, and at the Calhoun property significant levels of amphibole asbestos fibers were found in the dust in the home. All of the source material and contaminated soils were removed, and the interior of the Calhoun residence was cleaned. All restoration work has been completed at both properties.

i. The Johnson, Sanderson, Temple, Struck, Rice, Fuhlendorf, Spencer, and Westfall Properties: At all of these properties various vermiculite wastes containing amphibole asbestos concentrations up to 10% by PLM were discovered in yard or garden soils. In addition, individual "tremolite rocks" were found. At each of these areas, any large "tremolite rocks" were removed, the major source areas either covered or demarcated, and nature and extent sampling is underway. These properties are targeted for cleanup in the Spring of 2002.

j. The Champion Haul Road: Along a portion of this road, where it leads from Highway 37 into a residential area, vermiculite ore and/or tailings have been discovered with amphibole asbestos concentrations greater than 1% at the surface. These areas were covered with a durable geotextile fabric as a temporary cover, while nature and extent sampling is underway. This area is targeted for removal in the Spring of 2002.

2. Current actions

EPA is continuing its on-site investigations in Libby. These include the traditional nature and extent type sampling (see Phase I Sampling Plan, January 4, 2000), and also some site specific exposure scenario sampling (see Phase II Sampling Plan, March 2001). In addition, because of problems encountered with much of the standard light based microscopy (see Action Memorandum, May 23, 2000) the EPA has also undertaken an evaluation of some alternative analytical techniques for use in Libby (see Performance Evaluation Study, Parts A, B, and C). EPA has also endeavored to update some earlier work done jointly by OSWER and EPA Region 9, in updating the Superfund Risk Assessment methodology for asbestos.

Most Removal work begun or continued in Summer of 2001 is either complete or shut down for the winter, to resume next Spring as needed. Details for the completion of this work, and other similar projects are being developed by the Volpe Engineering Center and will be presented in a set of Site work plans this coming Spring and Summer. Other than a few pilot studies, and some simulations done as part of the Phase II Sampling effort, no Zonolite Insulation removals have been undertaken to date.

C. State, Local and Other Authorities' Roles

Continued involvement by the State of Montana, ATSDR, PHS, USGS, USFS, Lincoln County Health Board, Libby School Board, and City of Libby officials in this Removal Action is expected to be largely in the area of communication with the Libby community, a medical screening program, collection of background data, support, and routine sampling. The State of

Montana and local authorities were kept informed of the activities by EPA through a number of means.

ATSDR and PHS have taken the lead in the on-going medical investigations in Libby. A second phase of medical screening was begun in August 2001. ATSDR and PHS are also working with local physicians, Lincoln County, and the State Medical Officer in developing a full epidemiological case series for Libby Asbestos victims. This will focus on identifying the nature, presentation, and progression of the disease endpoints from exposure to Libby amphibole asbestos.

USGS is providing EPA with technical assistance in documenting the mineralogical and morphologic nature of the Libby amphibole asbestos. They are also conducting a remote sensing, infrared spectroscopy analysis of the Libby basin to help identify the presence of surface deposits (man-made or disturbed by human activity and undisturbed naturally occurring) of the amphibole asbestos. USGS has also been working with EPA on many of the analytical method issues, helping to augment and develop the Agency's analytical techniques.

The USFS is providing assistance at the Site with such issues as the road closure for Rainy Creek, traffic control, and fire management. In addition, the USFS is working with EPA to establish a long term plan for properties they own or control that have been impacted by the amphibole asbestos.

Lincoln County has actively engaged on helping to provide assistance on the medical screening and evaluations, as well as with patient care. The Lincoln County Health Officer has and continues to play a central role in the dissemination of medical information to all of the parties involved. Arrangements have been made for Lincoln County to take over the asbestos ambient air sampling in and around Libby, incorporating this into their already established Clean Air Act pm2.5 program.

Although they have participated in many of the community activities, and been involved with some of the planning efforts, the State of Montana does not have the needed resources to conduct the needed site investigations or clean-ups independently. They have deferred the lead on all Site activities to the EPA. EPA continues to provide information to the State, and continues to seek State Officials' input on the implementation of Removal Actions.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

Previous sections of this and the two preceding Action Memoranda have discussed the presence of amphibole asbestos at a number of locations in and around the Libby Valley. These discussions also document that at each location there exists, or there is the potential for a complete human exposure pathway. Thus, at each location people either have, or may, come into direct contact with the amphibole asbestos, causing the inhalation of unsafe levels of asbestos. There is also ample evidence that this asbestos may be tracked out on the clothing or the person of those directly exposed, and carried home, resulting in a secondary exposure.

The fundamental nature of this exposure does not change when dealing with any of the specific source materials or environmental media discussed in Section II of this memorandum. All of the materials in question have been shown to release amphibole asbestos fibers to the air

when disturbed. ZAI, for example appears to be inherently friable. Whether in work done during the Phase II sampling, by OPPTS, private corporations, or by W.R. Grace & Company, it has been clearly shown that contact with ZAI or the other vermiculite materials will create severe exposures to high levels of airborne Libby amphibole asbestos (see Administrative Record).

In Libby, these exposures are of a somewhat unique and paramount significance. From a multiplicity of sources, the ATSDR medical screening, the ATSDR mortality study, interviews with the local medical community, the medical investigations of W.R. Grace & Co., and previous investigations by NIOSH, it can be shown that the Libby community has a widespread medical problem related to exposure to Libby amphibole asbestos. In effect, a large portion of the community has been shown to have a highly compromised capability to fend off the effects of further asbestos exposure. This point is clearly underscored by the ATSDR finding of the multiplicity of exposure pathways to which people in the area have been exposed, and the proportional relationship between the number of exposure pathways and the increased findings of lung abnormalities.

Several studies have demonstrated the relationship between the findings of pleural and interstitial abnormalities, and the risk of progression of ever worsening asbestos related diseases (e.g.-Erlich et.al., 1992; Shepard, et. al., 1997; Cookson, et. al., 1986; Viallat, et.al., 1983). Likewise the description provided by area physicians of the presentation and progression of asbestos related diseases in Libby, along with the sheer number of patients presenting with clinical symptoms related to asbestos exposure with no known occupational contacts demonstrate the effect of these exposures have, and continue to have on the community.

While the workplace exposure to miners, and the widespread ambient exposures that once existed in Libby have been eliminated, there still exists in Libby multiple pathways for people to be exposed to amphibole asbestos. As the Agency's investigations and cleanups demonstrate, people have recently and may still encounter vermiculite mining wastes and ores in discrete areas around the community. The Screening Plant and Export Plant were open retail businesses as recently as 18 months ago. People attended football games and track meets, or practiced on the High School track when asbestos was present at the surface as recent as six months ago. Children wrestled on vermiculite tailings at the former ice skating rink at Plummer Elementary School 7 months ago. People are likely still encountering vermiculite wastes in their yards and gardens today. Because of the high percentage of homes with Zonolite insulation in Libby, local electricians and carpenters contact the insulation on a near daily basis in Libby. Any homeowner using their attic for storage or accessing it for other purposes will also likely be exposed.

These exposure will continue to have an additive effect on Libby residents until they are eliminated. Further these exposure will be aggravated by the terrain and meteorologic conditions that yield the weather inversions that worsen Libby's particulate problem. Libby's historic designation as a non-attainment area for particulates only exacerbates the effect of the asbestos exposure. Libby also has a high rate of smokers. The synergistic relationship between cigarette smoking and asbestos exposure has been clearly established.

The very age and nature of the residences and businesses which contain the Zonolite insulation in Libby contribute to the likelihood of contact with the amphibole asbestos in Zonolite. The Zonolite tends to be in the older homes, which require more maintenance and renovation. In Libby, which has the second lowest per capita income in Montana, the economic factors are such that many people tend to allow conditions needing repair to exist longer, and also tend to do the repairs themselves.

Most previous risk assessments dealing with Zonolite insulation, or other Libby vermiculite products have downplayed the frequency of the contact with the material. In its work, W.R. Grace contends that a homeowner who installed Zonolite insulation would have a once in a lifetime exposure to elevated levels of Libby amphibole for a period of less than four hours, resulting in a minuscule lifetime risk. This approach to evaluating the risks from Zonolite insulation ignores many factors. It does not account for the tradesman who, especially in Libby, encounters the Zonolite on a much more frequent basis. It ignores the person who uses the attic space for storage or other purposes. It assumes the home requires no renovation, nor other repairs (such as to fix a leaky roof, or evict squirrels nesting in the attic) that require one to work in the attic. It also ignores the potential for asbestos to be spread to the rest of the home during installation or renovation, and the subsequent re-exposure that would occur during normal household activities. EPA sampling in Libby to date has found that approximately 25% of the homes tested showed detectable levels of amphibole asbestos in the dust in the interior of the home. This type of assessment is belied by the results of the ATSDR medical screening which shows a significantly higher odds ratio for those reporting contact with vermiculite insulation (or other vermiculite materials) than those with simple ambient exposures.

There is also no doubt about the insidious toxicological nature of the amphibole asbestos found in Libby vermiculite. Adverse effects from these types of exposure have been documented among Grace workers in Libby, and around the country. There has also been a clear pathology associated with the secondary exposures. The medical screening conducted by ATSDR during the Summer of 2001 (see Attachment 4) clearly documents the occurrence of significant lung abnormalities among family members of former Grace employees. Likewise, the ATSDR screening also found significant rates of lung abnormalities among people with "recreational" contact with various vermiculite materials that contain the amphibole asbestos. Overall, the preliminary results of medical screening program to date show that 19 to 37% of tested participants had scarring in their chest wall. Unfortunately, 73% of the participants who showed lung abnormalities were not associated with W.R. Grace mining or processing activities. Excluding the former miners and their immediate family, the overall abnormality rate was 12 to 24%.

Similarly, as discussed in the May 23, 2000, Action Memorandum, there is evidence that Grace workers suffered high rates of asbestos related disease at their processing plants across the country, not just in Libby. Although investigations are in the early stages, it is not unreasonable to hypothesize, and early evidence suggests, that the family members of those workers, and those living around these plants, have also been adversely impacted. There already exists a documented case of an individual who as a child played in a stockpile of Libby vermiculite in Minneapolis, Minnesota who died from an asbestos related disease at the age of 43, clearly linked to the Libby amphibole asbestos.

In December 2000, ATSDR published the results from a standardized mortality study (see Attachment 9) based on a review of a subset of death certificates from the Libby area from 1979 to 1998. Among the studies findings were the following:

- Mortality from asbestosis was approximately 40 to 60 times higher than expected.
- Mortality from mesothelioma, a rare type of cancer associated with asbestos exposure also appeared elevated.

As was done prior to the Removal Actions begun last year, the Site On-Scene Coordinator requested that the Regional Toxicologist review that data collected from the Libby Asbestos Site. His most recent findings are summarized in memorandum form in Attachment 2. Generally, Dr.

Weis concludes that the amphibole asbestos found in various constructs of Libby vermiculite (e.g., raw ore, tailings, milled unexfoliated vermiculite) all yield significant amounts of respirable amphibole asbestos fiber when disturbed. He further concludes that exposure to these fibers have been shown to have pronounced medical consequences, and present an unacceptable risk to those who may contact the amphibole asbestos in the Libby vermiculite.

The results and conclusions discussed above are very consistent with what has been found internationally as well. At a conference held in Oakland, California on May 24-25, 2001, Dr. Marcel Goldberg, Head of the Health and Work Department of the French National Institute for Health Surveillance, presented a series of epidemiological studies from a number of locations around the world where there are environmental exposures to various amphibole asbestos minerals. In general, Dr. Goldberg presented documentation showing that direct contact with these materials (with some striking similarities to the conditions found in Libby) resulted in the marked increased presentation of lung diseases such as fibrosis, mesothelioma, and lung cancer. The entirety of the materials presented at the Oakland Conference, as well as a transcript of the proceedings have been included in the Site Administrative Record.

Another presenter at the Oakland conference was Dr. McDonald of Magill University. As discussed in the May 23, 2000, Action Memorandum Dr. McDonald had conducted a study in the mid 1980s (see McDonald, 1987 in the Administrative Record) on a cohort of Grace employees, finding elevated incidence of lung abnormalities, lung cancer, and mesothelioma. Prior to the Oakland conference Dr. McDonald did a brief update on the cohort of workers he studied in the 1980s. Once again his research showed that the Grace workers suffered a remarkable incidence of these lung diseases. When asked about the toxicity of the amphibole asbestos found in the Libby vermiculite, Dr. McDonald termed it "quite astounding."

The above discussed information, along with the host of other information found in the Site Administrative Record has led the EPA to make the following general conclusions regarding asbestos exposure in Libby:

- 1) Whenever materials associated with Libby vermiculite can be found in bulk, there will most likely be associated with it high concentrations of amphibole asbestos;
- 2) The amphibole asbestos found in the Libby vermiculite is highly toxic;
- 3) The amphibole asbestos associated with the Libby vermiculite readily produces respirable fibers when disturbed;
- 4) Any time when there exists a condition such that there will be people in or around the amphibole asbestos there is a high probability for exposure, and this probability presents an unacceptable risk to public health.
- 5) As the number of exposure routes increase so does the risk of developing lung abnormalities and further progressing to symptomatic asbestosis related disease.

With this information for background, the following is a discussion on the criteria used to determine the need for a Removal Action found in the National Contingency Plan at 40 CFR 300.415(b)(2) that relate to the conditions now found in Libby, Montana. The evaluation of these factors clearly demonstrates that the conditions at the Site may present an imminent and substantial threat to human health and the environment and meet the criteria for initiating a Removal Action under Section 300.415(b)(2) of the NCP.

1. **300.415(b)(2)(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances:** High levels of amphibole asbestos can be made airborne through contact with vermiculite ores and

mining/processing wastes, amphibole asbestos in settled dust, and Zonolite insulation. Amphibole asbestos has been found in over 60% of the gardens, 40% of the yards, and 18% of the driveways tested through December 2001. Amphibole asbestos was found in the dust in 25% of the buildings sampled through December 2001. Amphibole asbestos has been found in ZAI which is prevalent throughout the Libby Valley. Whether happening to home and business owners, or to local tradesmen, exposures to amphibole asbestos through a number of sources and environmental media are occurring on a continuous basis. Given the number of cases of secondary asbestos exposures that resulted in disease among the family members of former mine workers, it is likely that amphibole asbestos fibers are being tracked from source areas as "take home" exposures as well.

2. 300.415(b)(2)(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released: The semi-arid climate of the area is characterized by harsh winters and hot summers. This leads to more maintenance among the older homes in Libby, which tend to have the Zonolite insulation. The Libby area is also subject to heavy winter inversions, trapping particulate matter and airborne fibers in the Libby Valley, thus aggravating exposures.

3. 300.415(b)(2)(vii) The (lack of) availability of other appropriate federal or state mechanisms to respond to the release: No other Local, State, or Federal agency is in the position or has the resources to independently implement an effective response action to address the on-going threats presented at the site. EPA will coordinate its actions with State and Local authorities.

4. 300.415(b)(2)(viii) Other situations or factors that may pose threats to public health or welfare of the United States or the environment: In Libby, it has been well documented that occupational, secondary, and environmental exposures of the public to a hazardous substance have resulted in a broad and unprecedented impact on public health. While the full medical impact of the amphibole asbestos exposure in Libby will likely never be known, it is nonetheless unprecedented. The asbestos related deaths in Libby over the last two decades number in the hundreds. There are currently hundreds more who suffer from asbestos related illnesses. Based on the information coming from the ATSDR medical screening more than a thousand people will have asbestos related scarring in their lungs, or the pleural lining of their lungs. While it is hoped that most of these people will not become symptomatic of asbestos related disease, too many undoubtedly will. This adverse biological impact, the observed scarring in the chest cavity, is an early step in the progression of many asbestos related pathologies. People with this type of scarring within their chest cavity are at a much higher risk for developing lung cancer, mesothelioma, and/or fibrosis. The sheer magnitude of the medical impact in Libby dictates the need for an expedient and thorough response. Unfortunately, because of the latencies of asbestos related diseases there is no easy way to directly correlate exposure to amphibole asbestos today to the direct development of an asbestos related disease. The only way to determine this for certain is to observe an individual for 10 to 40 years after exposure to see if they become sick. However, waiting for this type of certainty before acting to remove the sources of amphibole asbestos exposure would be unconscionable, and does not meet CERCLA's mandate for "protection" of public health and the environment. CERCLA was designed and enacted to prevent illness and death resulting from the actual or potential exposure to hazardous substances, not wait for the occurrence of illness and death to prove the existence of a threat. Prudence would require that in the face of the history of amphibole asbestos exposure in Libby, and the breadth of its impact, that direct and

immediate steps be taken to eliminate to the extent possible the exposure of people to this material.

Given the breadth and scope of the medical impact in Libby, and the factors discussed above, the release of amphibole asbestos in Libby, including those releases associated with Zonolite insulation, constitute a public health emergency.

B. Threats to the Environment

The primary threat identified is exposure to human populations, with only secondary concerns for exposure to domestic or feral animals. The Action Memorandum dated May 23, 2000, contains some additional discussion about potential threats to the environment, but they will not be repeated here.

IV. ENDANGERMENT DETERMINATION

The actual or threatened releases of airborne asbestos from this Site, if not addressed by implementing the response action selected in this Action Memorandum, and those begun earlier (See Action Memorandum dated May 23, 2000), may present an imminent and substantial endangerment to public health, welfare, or the environment. The conditions in Libby associated with the release of amphibole asbestos from all sources, including Zonolite insulation, present a public health emergency. This Action Memorandum Amendment, upon approval, constitutes the formal determination that there exists a public health emergency at the Site.

V. EXEMPTION FROM STATUTORY LIMITS

The Action Memorandum dated May 23, 2000, provided the documentation required by the NCP at 40 CFR 300.415(b)(5)(i) to receive an exemption from the normal \$2 million and one year limit on Removal Response Actions. Conditions at the Libby Asbestos Site still warrant this exemption. Hence this Action Memorandum Amendment requests a ceiling increase under the already granted exemption beyond the \$6 million response decision making authority delegated to the Region. This ceiling increase is necessary to complete the Removal Actions authorized by the Action Memorandum dated May 23, 2000, the Action Memorandum Amendment dated August 13, 2001, and the additional Removal Actions as described in this Amendment.

A. Emergency Exemption:

As was documented in the original Action Memorandum for the Site, conditions at the Libby Asbestos Site meet the criteria set forth in CERCLA §104(c)(1)(A) [40 CFR 300.415 (b)(5)(i) of the NCP]. That is, as discussed above, there exists in Libby immediate risk to public health or welfare or the environment; continued response actions are immediately required to prevent, limit, or mitigate an emergency; and such assistance will not otherwise be provided on a timely basis. At all the locations discussed in this Action Memorandum if Removal Actions are not initiated or continued then people will be exposed to unsafe levels of amphibole asbestos. Removal Action expenditures at the Libby Asbestos Site will be tracked cumulatively against a (single) total Site ceiling. Any subsequent locations within the Site where actions are deemed immediately necessary as of the result of the on-going investigations in Libby will be documented appropriately and added to the Administrative Record. These actions will likewise be covered by the already established emergency, and tracked in a cumulative fashion.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1.0 Proposed action description

EPA proposes to continue and/or initiate actions which will mitigate the threat to the public health and welfare or the environment posed by the amphibole asbestos present at a number of locations where vermiculite ores and mining wastes have come to be located. In addition, EPA proposes to remove ZAI and amphibole asbestos contaminated dust from homes and business within the Libby Valley.

Removal amphibole asbestos associated with vermiculite ores and mining/processing wastes in outdoor settings will be done by either mechanical excavation or the use of a vacuum truck when possible. Appropriate Site controls and decontamination facilities will be used as needed.

Although there will be variation among individual homes and buildings, the basic approach to Removal of ZAI and amphibole asbestos contaminated dust for a property will be as follows:

- a. Establishment of asbestos controls including physical barriers, negative air, decon/entry/exit corridor.
- b. Bulk removal of Zonolite insulation from attic and walls (if necessary).
- c. Removal/disposal of carpet (if contaminated).
- d. HEPA vacuuming the interior of the home.
- e. Restoration as needed.

In order to allow for year round operations, and to accommodate the smaller scope of the individual property clean ups, the EPA will evaluate the feasibility and cost effectiveness of constructing an asbestos disposal cell at the Lincoln County Landfill in lieu of disposal at the mine site.

In accordance with Section 300.415(l), EPA will pursue appropriate arrangements for post-removal site controls at the cleanup locations, as needed, and at the disposal site to ensure the long-term integrity of the removal.

In order to operate in a systematic and efficient order the EPA proposes to conduct the work working in discrete geographic areas, doing contiguous properties concurrently where possible. Work will begin in the downtown Libby area closest to the former Export Plant, working outward through the Site. Priority will be given to properties with multiple exposure pathways present, such as houses with dust contamination, amphibole asbestos in the garden, and ZAI leaking from the attic. Priority will also be given to properties where because either amphibole asbestos concentrations are so high (e.g.-presence of Stoner rock at the surface), or because of a current condition or activity (e.g.-undergoing a remodeling) that a high airborne exposure is likely to occur otherwise.

2. Contribution to remedial performance

The Site is not currently on the National Priorities List (NPL). However, with the impending NPL proposal the OSC and RPM have been collaborating on all sampling investigations and efforts are already being made to ensure that any removal investigation work is consistent with that required by a remedial investigation. Similarly, the RPM is involved with most all Removal Planning (such as evaluating the use of the Lincoln County Landfill) to ensure that clean-up goals and long-term management needs are met. Given this close coordination the current removal actions will be consistent with any remedial cleanup that might be taken.

3. Description of alternative technologies

No alternative technologies were found to be appropriate given the nature of the amphibole asbestos contamination, the scope of the project, and its time-critical nature. If in the course of these, or any subsequent removal actions at the Site, any alternative remediation technologies are identified that will enhance response actions, they will be considered as appropriate.

4. EE/CA

This is a Time-Critical Removal Action; thus, an EE/CA is not required.

5. Applicable or relevant and appropriate requirements

See the Federal and State ARARs identified and/or discussed in the Action Memorandum (May 23, 2000).

6. Project Schedule

As with any project of this scope and complexity, the planned schedule is highly subject to change and readjustment. If any new locations are discovered that in the judgement of the Site OSC warrant more immediate action, there may be wholesale shifts in timing. Given the rather short construction season in this part of Montana, this could mean the delay of some actions until the next construction season, in Spring 2003. Pending approval of this Action Memorandum Amendment work will begin this Spring. Completing the excavations and restorations already underway will be the first priority. The construction of the infrastructure necessary to support the clean-up of the individual homes in the Libby Valley will be the second. The start of removal of ZAI and vermiculite ores and mining wastes from the downtown area should begin this Summer. Work is likely to take two to three construction seasons. A more detailed schedule will be developed with Head Quarters approval of this Action Memorandum Amendment.

7. Estimated Costs

The costs estimates presented in this section will be presented in two parts. The first will be the proposed overall Site ceiling, incorporating the current Site ceiling and costs to date by removal area, and the proposed increases for due to the

increase in the number of properties where vermiculite ores and mining/processing wastes have been found, as well as increases in the request to closeout on-going projects, and the removal of ZAI. A planning figure for the construction of an asbestos landfill cell will be included as well. The second part will be a breakdown of the estimated cost per property for ZAI removal.

EXTRAMURAL COSTS	Current Ceiling (Action Memo - 8/13/01)	Proposed Ceiling Increase	Proposed Ceiling (Total Project Cost)
1. Export Plant (PRP - Lead)	\$1,525,000	\$ 100,000	\$ 1,625,000
2. Screening Plant (Fund - Lead) -Removal Work - Settlement (Parker)	\$7,605,000 1,500,000	\$ 1,000,000 -0-	\$ 8,600,000 1,500,000
3. KDC Properties (Screening Plant)	\$1,500,000	\$ 500,000	\$ 2,000,000
4. School Tracks and other Affected Areas	\$2,500,000	\$ 1,000,000	\$ 3,500,000
5. Residential Areas	\$ 600,000	\$ 2,500,000	\$ 3,100,000
6. Rainy Road	\$1,500,000	-0-	\$ 1,500,000
7. Landfill Cell Design and Construction	-0-	\$ 3,000,000	\$ 3,000,000
8. ZAI Removal/Interior Clean-up	-0-	\$25,000,000	\$25,000,000
Subtotal Extramural	\$16,930,000	\$28,100,000	\$45,030,000
Contingency (20%)	\$ 3,386,000	\$ 5,620,000	\$ 9,006,000
Total Extramural Costs	\$20,316,000	\$33,720,000	\$54,036,000
INTRAMURAL COSTS			
1. EPA Direct Costs	\$ 210,000	\$ 100,000	\$ 150,000
2. EPA Indirect Costs	\$ 400,000	\$ 250,000	\$ 250,000
Total Intramural Costs	\$ 610,000	\$ 350,000	\$ 400,000
TOTAL	\$20,976,000	\$34,070,000	\$54,436,000

Extramural Costs- Zonolite Removal				
	Residences	Item	Unit Rate	
		Labor	\$ 8,000	
		Equipment	\$ 3,000	
		Restoration	\$ 4,000	
		Sampling	\$ 1,000	
		Overhead	\$ <u>4,000</u>	
		Total	\$20,000	
	800 @ \$20,000			\$16,000,000
	Businesses			
		Labor	\$18,000	
		Equipment	\$ 6,000	
		Restoration	\$ 7,000	
		Sampling	\$ 2,000	
		Overhead	\$ <u>4,000</u>	
		Total	\$37,000	
	100@ \$37,000			\$3,700,000
	Public Buildings			
		Labor	\$30,000	
		Equipment	\$12,000	
		Restoration	\$14,000	
		Sampling	\$ 4,000	
		Overhead	\$ <u>2,000</u>	
		Total	\$62,000	

	15@ \$62,000			\$ 930,000
Subtotal				\$20,630,000
20% Contingency				\$ <u>4,126,000</u>
Total				\$24,756,000

There are other EPA Region VIII expenditures at the Libby Asbestos Site that are tracked separately from the above mentioned Removal Ceiling. These are the costs associated with the Removal Site Investigation (a.k.a. - Phase I Investigation), costs incurred by the Region to support the ATSDR Medical Screening, the Performance Evaluation Study, the funds given to USGS for technical support, the Exposure Scenario Investigation (a.k.a. -Phase II Investigation), funds provided to develop a site specific Risk Assessment, and funds used to help update the Superfund Program's Generic Asbestos Risk Assessment. For clarification purposes only, below is an estimate of the project budget for each of these items:

Task	Regional Project Budget (FY00/01)	Regional Project Budget (FY02)
Phase I Sampling Investigation	\$ 4,500,000	\$2,000,000
Medical Screening Support	\$ 500,000	-0-
PE Study	\$ 700,000	\$ 50,000
USGS	\$ 1,000,000	\$ 50,000
Phase II Sampling Investigation	\$ 1,000,000	\$ 100,000
Site Specific Risk Assessment	\$ 300,000	\$ 200,000
Generic Risk Assessment	\$ 500,000	\$ 20,000
TOTAL	\$ 8,500,000	\$2,420,000

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed action will continue to allow the public to be exposed to unsafe amounts of amphibole asbestos. This will increase the risk to public health, and continue to burden an already heavily impacted community.

VIII. OUTSTANDING POLICY ISSUES

The Removal Actions described as part of this Action Memorandum raise two issues of fundamental importance: 1) the declaration of a public health emergency in Libby; and 2) the removal of a Zonolite Attic Insulation.

IX. ENFORCEMENT

X. RECOMMENDATION

This decision document represents the selected Removal Action for the removal of Zonolite insulation from homes, businesses, and public buildings in the Libby Valley, which is within the Libby Asbestos Site, located in Libby, Lincoln County, Montana. The proposed Removal Actions have been developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the Administrative Record for the Site.

Conditions at the Site meet the NCP §300.415(b) criteria for a Removal Action and NCP §300.415(b)(5)(i) criteria for exemption from statutory limits. I recommend your approval of the proposed Removal Action. The costs include a ceiling increase of \$33,720,000, with a total project ceiling of \$54,436,000.

Approve: _____ **Date:** _____

Marianne Lamont Horinko
Assistant Administrator
Office of Solid Waste and Emergency Response

Disapprove: _____ **Date:** _____

Marianne Lamont Horinko
Assistant Administrator
Office of Solid Waste and Emergency Response